

INFLUENZA T CELL EPITOPES

Table 1. Influenza A virus CTL Epitopes of the Nucleoprotein

Amino Acid Positions (ref.)	Host	MHC restriction	
44-52 (ref. 14)	human	HLA-A1	
50-63 (ref. 3)	mouse (CBA)	H-2Kk	
91-99 (ref. 13)	human	HLA-Aw68	
147-158 (ref. 5)	mouse (Balb/c)	H-2Kd	
265-273 (ref. 14)	human	HLA-A3	
335-349 (ref. 1)	human	HLA-B37	
335-349 (ref. 2)	mouse	HLA-B37	
365-380 (ref. 2)	mouse	H-2Db	
366-374 (ref. 9)	mouse (C57B1/6)	H-2Db	
380-388 (ref. 16)	human	HLA-B8	
383-391 (ref. 16)	human	HLA-B27	

Table 2. Influenza A virus T helper Epitopes of the Nucleoprotein

Amino Acid Positions (ref.)	Host	MHC restriction	
55-69 (ref. 8)	mouse (Balb/c)	H-2Kd	
182-205 (ref. 11)	human		
187-200 (ref. 8)	mouse (CBA)	H-2Kk	
	mouse (Balb/c)	H-2Kd	
216-229 (ref. 8)	mouse (Balb/c)	H-2Kd	
206-229 (ref. 11)	human	HLA-DR1, HLA-DR2 en	
, , ,		HLA-DRw13	
260-283 (ref. 8)	mouse (CBA)	H-2Kk	
	mouse (C57B1/6)	H-2Db	
	mouse (B10.s)	H-2s	
297-318 (ref. 11)	human		
338-347 (ref. 16)	human	HLA-B37	
341-362 (ref. 11)	human		
413-435 (ref. 8)	mouse (C57B1/6)	H-2Db	

Table 3. Influenza A virus T cell Epitopes of Other Viral Proteins

Peptide	Host	T cell type	MHC restriction
PB1 (591-599) (ref. 14)	human	CTL	HLA-A3
HA (204-212) (ref. 16)	mouse	CTL	H-2Kd
HA (210-219) (ref. 16)	mouse	CTL	H-2Kd
HA (259-266) (ref. 16)	mouse	CTL	H-2Kk
HA (252-271) (ref. 7)	mouse	CTL	H-2Kk
HA (354-362) (ref.16)	mouse	CTL	H-2Kk
HA (518-526) (ref. 16)	mouse	CTL	H-2Kk
HA (523-545) (ref. 10)	mouse	CTL	
NA (76-84) (ref.16)	mouse	CTL	H-2Dd
NA (192-201) (ref. 16)	mouse	CTL	H-2Kd
M1(17-29) (ref. 6)	human	T helper	HLA-DR1
M1 (56-68) (ref. 4)	human	CTL	HLA-A2
M1(58-66) (ref. 12)	human	CTL	HLA-A2
M1(128-135) (ref. 15)	human	CTL	HLA-B35
NS1(122-130) (ref. 15)	human	CTL	HLA-A2
NS1(152-160) (ref.16)	mouse	CTL	H-2Kk

References

- (1) McMichael, A. J., Gotch, F. M. & Rothbard, J. HLA B37 determines an influenza A virus nucleoprotein epitope recognized by human cytotoxic T lymphocytes. J. Exp. Med. 164, 1397-1406, 1986.
- (2) Townsend, A. R. M., Rothbard, J., Gotch, F. M., Bahadur, G., Wraith, D. & McMichael, A. J. The epitopes of influenza nucleoprotein recognized by cytotoxic T lymphocytes can be defined with short synthetic peptides. Cell 44, 959-968, 1986.
- (3) Bastin, J., Rothbard, J., Davey, J., Jones, I. & Townsend, A. Use of synthetic peptides of influenza nucleoprotein to define epitopes recognized by class I-restricted cytotoxic T lymphocytes. J. Exp. Med. 165, 1508-1523, 1987.
- (4) Gotch, F., Rothbard, J., Howland, K., Townsend, A. & McMichael, A. Cytotoxic T lymphocytes recognize a fragment of influenza virus matrix protein in association with HLA-A2. Nature 326, 881-882, 1987.
- (5) Bodmer, H. C., Pemberton, R. M., Rothbard, J. B. & Askonas, B. A. Enhanced Recognition of a Modified Peptide Antigen by Cytotoxic T Cells Specific for Influenza Nucleoprotein. Cell 52, 253-258, 1988.
- (6) Ceppelini, R., Frumento, G., Ferrara, G. B., Tosi, R., Chersi, A. & Pernis, B. Binding of labelled influenza matrix peptide to HLA DR in living B lymphoid cells. Nature 339, 392-394, 1989.

- (7) Sweetser, M. T., Morrison, L. A., Braciale, V. L. & Braciale, T. J. Recognition of preprocessed endogenous antigen by class I but not class II MHC-restricted T cells. Nature 342, 180-182, 1989.
- (8) Gao, X-M., Liew, F. Y. & Tite, J. P. Identification and Characterization of T Helper Epitopes in the Nucleoprotein of Influenza A Virus. J. Immunol.143, 3007-3014, 1989.
- (9) Rotzschke, O., Falk, K., Deres, K., Schild, H., Norda, M., Metzger, J., Jung, G. & Rammensee, H. G. Isolation and analysis of naturally processed viral peptides as recognized by cytotoxic T-cels. Nature 348, 252-254, 1990.
- (10) Milligan, G. N., Morrison, L. A., Gorka, J., Braciale, V. L. & Braciale, T. J. The Recognition of a Viral Antigenic Moiety by Claas I MHC-Restricted Cytolytic T Lymphocytes is Limited by the Availability of the Endogenously Processed Antigen. J. Immunol. 145, 3188-3193, 1990.
- (11) Brett, S. J., Blau, J., Hughes-Jenkins, C. M., Rhodes, J., Liew, F. Y. & Tite, J. P. Human T Cell Recognition of Influenza A Nucleoprotein. Specificity and Genetic Restriction of Immunodominant T Helper Cell Epitopes. J. Immunol. 147, 984-991, 1991.
- (12) Bednarek, M. A., Sauma, S. Y., Gammon, M. C., Porter, G., Tanhankar, S., Williamson, A. R. & Zweerink, H. J. The minimum peptide epitope from the influenzavirus matrix protein. Extra and intracellular loading of HLA-A2. J. Immunol. 147, 4047-4053, 1991.
- (13) Cerundolo, V., tse, A. G. D., Salter, R. D., parham, P & Townsend, A. CD8 independence and specificity of cytotoxic T-lymphocytes restricted by HLA Aw68.1. Proc. Roy. Soc. Lond. Series B boil. Sci. 244, 169-177, 1991.
- (14) DiBrino, M., Tsuchida, T., Turner, R. V., Parker, K. C., Coligan, J. E. & Biddison, W. E. HLA-A1 and HLA-A3 T-cell epitopes derived from influenza-virus proteins predicted from peptide binding motifs. J. Immunol. 151, 5930-5935, 1993.
- (15) Dong, T., Boyd, D., Rosenberg, W., Alp, N., Takiguchi, M., McMichael, A. & Rowland-Jones, S. An HLA-B35-restricted epitope modified at an anchor residue results in an antagonist peptide. Eur. J. Immunol. 26, 335-339, 1996.
- (16) Parker, C. E. & Gould, K. G. Influenza A virus. A model for viral antigen presentation to cytotoxic T lymphocytes. Seminars in Virology 7, 61-73, 1996.